A SEA CHANGE IN AIDS TO NAVIGATION

Switching nav aids to LED lights and smaller batteries will save the Coast Guard more than money

By Bill Bleyer

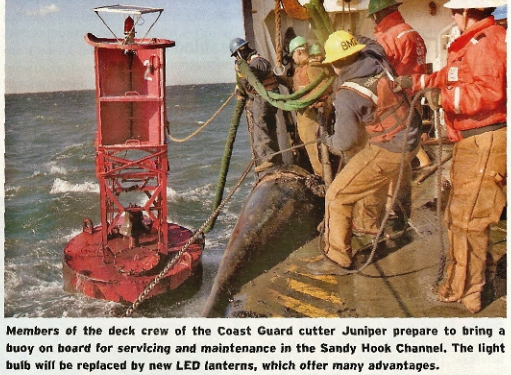
The Coast Guard cutter Juniper edged alongside Buoy 32A, marking a rocky shoal in western Long Island Sound.

Following orders from the 225-foot buoy tender's bosun, Mike Tomasi, two crewmembers grabbed the red navigation aid bobbing in 6-inch waves with long boathooks. They wrestled it against the black hull, its bell ringing rapidly as if it was annoyed at being disturbed. Thus begins a carefully choreographed 2-1/2-hour operation.

It had been three years since the buoy had been pulled from the Sound for routine maintenance: getting a rusted mooring chain replaced, barnacles and seaweed scraped off and burned out light bulbs and old battery replaced.

But this overhaul was not routine. Rather than replacing the bulbs and battery with the same equipment, the Juniper was giving Bouy 32A a generational makeover that represents a sea change in technology. As part of a nationwide Coast Guard initiative, the old lighting system — consisting of a large battery similar to one found in a car, a ring of six incandescent bulbs that change automatically when one burns out, and a large solar panel to recharge the battery — was replaced by a small lantern consisting of a single LED light and smaller batteries surrounded by five small solar panels.

The LED technology is cheaper, lasts longer, requires less maintenance and is less subject to damage, the Coast Guard says. It represents the biggest shift in buoy technology since solar panels were introduced to charge the batteries in 1983.



Members of the deck crew of the Coast Guard cutter Juniper prepare to bring a buoy on board for servicing and maintenance in the Sandy Hook Channel. The light bulb will be replaced by new LED lanterns, which offer many advantages.

The changeover began about a year ago, and the agency hopes to have replaced the mechanisms in half of its 5,400 red-and-green lighted buoys nationwide by next year. It has done about 1,000 so far. The lights are also being changed on 10,100 shore-based aids to navigation such as daymarks. So far more than 330 have been converted to LEDs.

Juniper, based in Newport, R.I., is responsible for maintaining 214 larger buoys — including 141 red-and-green ones — from southern Cape Cod to Tom's River, N.J. It is ahead of the curve; it reached the 50-percent goal with Buoy 32A.

The Juniper maintains buoys 8 and 9 feet in diameter and 26 and 35 feet high respectively. They weigh 12,000 and 20,000 pounds, and are held in place by concrete blocks called sinkers ranging in weight from about 8,000 pounds to 20,000 pounds. Bouy 32A is an 8-footer.

Two smaller buoy tenders share Juniper's territory and maintain bay and river buoys, which are also getting the LED systems.

"With the LED, everything is all in one unit," says LCDR Rick Wester, the Juniper's 36-year-old captain. "You've got a small top solar panel and four on the sides. The batteries are inside and, instead of light bulbs, you have an LED light. So if there is a problem, a small boat can go out, unscrew it and just replace it with a new one."

Because the old batteries were inside a hatch in the base of the buoy, Wester said, any problem with a battery or wiring required a house call from Juniper because it's impossible to open the hatch while the buoy is still in the water. Besides being smaller and located in the lantern atop the buoy, the new batteries have a lifespan of six years — several years longer than the old model, Wester said.

But it is the added reliability that is the biggest advantage of the LED lights made by a Canadian firm, Carmanah Technologies Corp.

The old lighting system and particularly the solar panels were exposed to damage from weather and passing vessels. "We had the April 16th storm that came through and we had eight of our buoys in this area with everything stripped off of them," Wester said.

"Most of our buoys have a bell or

gong that in rough seas cause a lot of vibration," Wester said. That can cause the incandescent bulbs to rotate even though they have not burned out; after all six have been rotated, the buoy will be dark. "Because it has moving parts, things will get jammed.

"The LEDs are resistant to vibration," he continued. Wester served on a buoy tender in Iraq and installed LED lanterns while they were still being tested in the United States.

"One of the buoys sank and we retrieved it 36 hours later and it was still blinking. [A] Carmanah [representative] rode with us a couple of months ago and turned one on and let our crew members pound it with a sledgehammer." The crew could not knock out the light.

While the LEDs produce a red or green light, the incandescent bulbs are white. "To make a green or red you have to add a colored lens and then you lose 70 percent of the [illumination]," Wester said. "To make up for that loss of power you have larger batteries" — sometimes several for one buoy.

Because the old larger solar panels were mounted on frames above the lantern, they were exposed and easily damaged or stolen because they could be used for other applications, Wester said.

Chief Petty Officer Kat McSweeney prepares to install an LED lantern on a buoy aboard the cutter Juniper.

"Fishing boats go by with their outriggers and they'll knock them right off. And there is an area for a bird to build a nest and poop on it," he said. "If 10 percent of the panel is covered, the battery will die eventually."

And theft should not be a problem because these new solar panels cannot operate independently of the lens.

"Another advantage is that with all of the old batteries, the buoy sits lower in the water and may be harder to pick up on radar," Wester said.

"The LEDs require 25 percent of the energy that an incandescent lamp would require," said Larry Jaeger, an engineer in the Coast Guard Ocean Engineering Division in Washington, which organized the LED changeover. So the batteries and solar panels can be much smaller and incorporated into the lantern structure. The LED lanterns are cheaper, from $1,250 to $1,900 compared to about $1,400 to about $2,400 for the old units.

"The LED is a solid-state device so there's nothing to burn out," he said. "They slowly degrade over time," but last for 200,000 hours (nearly 23 years) compared to a bulb that lasts six months to a year.

Shedding the high-maintenance lighting will allow the Juniper and other buoy tenders to spend more time on other increasingly important functions such as national security.

"Right now about 70 percent of our hours are spent on buoy tending," Wester said. "Because of this changeover, next year it will be less than 50 percent. We'll be doing more law enforcement." The Juniper also serves as an icebreaker and can skim up oil spills.

But one recent workday was taken up with maintaining three buoys in the Sound. Out at 32A, the crew attached a series of control lines and winch cables before the bosun pointed skyward and shouted "Up!"

Seaman Juan Reyes moved the controls on a 40,000-pound-capacity crane and the 26-foot-tall buoy was yanked free of the water and perched on the edge of the deck, a long beard of seaweed dangling from its sides.

The buoy was winched across the deck, lowered onto two large wooden chocks and chained in place. Petty Officer James Caraglin climbed on a wooden ladder and unbolted the hatch with a pneumatic gun to retrieve the battery from an internal rack. Senior Chief Kathleen McSweeney climbed to the top of the frame and unbolted the old lantern and solar panel and installed the LED unit with four bolts. Seaman Apprentice Melissa Murch and Seaman Apprentice Peter Hardy get the dirtiest job, scraping the barnacles and seaweeds off the buoy with spades. Other crewmembers replaced a 45-foot rusted section of chain.

Tomasi had the sinker lowered over the side and announced, "Ready to throw the rock down."

The buoy was reconnected to the chain and Tomasi ordered, "Bring it up." The crane lifted 32A and it hovered over the side as an automatic positioning system kept the ship in the proper location. "Put it down," Tomasi said.

With the swinging buoy's bell clanging rapidly, Juniper steamed east. ■